

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY


(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 26 JUL 2005

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Applicant's or agent's file reference SYN 60015/WO		<b>FOR FURTHER ACTION</b>		See Form PCT/PEAA16
International application No. PCT/GB2004/002262		International filing date (day/month/year) 26.05.2004		Priority date (day/month/year) 04.06.2003
International Patent Classification (IPC) or national classification and IPC C07C7/167, C07C7/163, B01J23/63, B01J23/44				
Applicant JOHNSON MATTHEY PLC				
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau) a total of 2 sheets, as follows:</p> <p><input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input checked="" type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>				
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input checked="" type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input checked="" type="checkbox"/> Box No. VIII Certain observations on the international application</p>				
Date of submission of the demand  10.12.2004		Date of completion of this report  25.07.2005		
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465		Authorized Officer  Holzwarth, A  Telephone No. +49 89 2399-7269		



**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/GB2004/002262

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**Box No. I Basis of the report**

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1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language, which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
  - ☐ publication of the international application (under Rule 12.4)
  - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

**Description, Pages**

1-10 as originally filed

**Claims, Numbers**

1-16 received on 10.12.2004 with letter of 08.12.2004

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT  
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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	4,5,14,15
	No: Claims	1-3,6-13,16
Inventive step (IS)	Yes: Claims	
	No: Claims	4,5,14,15
Industrial applicability (IA)	Yes: Claims	1-16
	No: Claims	

2. Citations and explanations (Rule 70.7):

**see separate sheet**

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**Box No. VII Certain defects in the international application**

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The following defects in the form or contents of the international application have been noted:

**see separate sheet**

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**Box No. VIII Certain observations on the international application**

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The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

**see separate sheet**

**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement**

Reference is made to the following documents:

- D1: US 2002/068843 A1 (DAI WEI ET AL) 6 June 2002 (2002-06-06)
- D2: IMAMURA H ET AL: "Hydrogenation behavior of propyne on supported Eu-Pd and Yb-Pd bimetallic catalysts with anomalous hydrogen uptake" JOURNAL OF ALLOYS AND COMPOUNDS, ELSEVIER SEQUOIA, LAUSANNE, CH, vol. 303-304, May 2000 (2000-05), pages 514-519, XP004204411 ISSN: 0925-8388
- D3: S. H. MOON ET AL.: "Selective hydrogenation of acetylene on Pd/SiO<sub>2</sub> catalysts promoted with Ti, Nb and Ce oxides" CATALYSIS TODAY, vol. 63, 30 November 2000 (2000-11-30), pages 183-188, XP002290968

**The present application does not meet the criteria of Article 33(1) PCT, because of the following reasons:**

**1.1** As the applicant filed amendments, which go beyond the application as originally filed (see also under point VII) in the examination below it was assumed that in claims 1 and 12 a support selected from the list in claim 2 was meant.

**1.2 D1** (examples 1-15, comparative examples 1,3; tables 1,2,4,5; claims 1,12,17-24) discloses selective acetylene hydrogenation catalysts comprising a palladium compound supported on a support (in the examples alumina was used), which further comprises a lanthanide compound.

**D2** (abstract; paragraphs 2.2, 3.1) discloses selective acetylene hydrogenation catalysts comprising a palladium compound supported on a silica-support, which further comprises a lanthanide (Eu or Yb) compound.

**D3** (abstract; table 1; paragraphs 2.1, 3.1) discloses selective acetylene hydrogenation catalysts comprising a palladium compound supported on a silica-support, which further comprises cerium as a lanthanide compound.

**Therefore the subject-matter of at least the claims 1, 12 and 16 is not new in the sense of Article 33(2) PCT in view of D1.**

**1.2** Dependent claims 2-11 and 13-15 do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT with respect to novelty and/or inventive step, because said additional features are either disclosed in the prior art documents (see above) or are trivial or within the competence of a skilled person looking for alternative catalysts or processes.

**Re Item VII**

**Certain defects in the international application**

In independant claims 1 and 12 the feature "alumina support" has been replaced by "support", so that the claim now refers to any support material. The same problem applies to claim 12. **The above amendments in claim 1 and 12 introduce subject-matter which extends beyond the content of the application as filed, contrary to Article 34(2)(b) PCT.**

**Re Item VIII**

**Certain observations on the international application**

**The application does not meet the requirements of Article 6 PCT, because of the following reasons:**

Claim 16 refers to a process according to claim 12-15 using a catalyst according to any one of the claims 1-11. Claim 12, is not formulated as a dependant claim but employs a catalyst according to claim 1. Claim 16 therefore contains a redundant back reference to claim 1. **Therefore claims 1 and 16 are unclear.**

**PCT/GB2004/002262 Amended Claims**

1. A catalyst suitable for use in the hydrogenation of a hydrogenatable organic compound which consists essentially of a palladium compound supported upon a support material characterised in that said catalyst further comprises a compound of a lanthanide.
2. A catalyst as claimed in claim 1 wherein the support is selected from silica, titania, magnesia, alumina, silica-alumina, a calcium-aluminate cement or a mixture of these compounds.
3. A catalyst as claimed in claim 2 wherein the support comprises alumina.
4. A catalyst as claimed in any of claims 1 – 3 wherein the mean pore diameter lies within the range 0.05 – 1 micron.
5. A catalyst as claimed in any of the preceding claims wherein the catalyst is in the form of shaped particles having a minimum dimension greater than 1mm.
6. A catalyst as claimed in any of the preceding claims, wherein the lanthanide compound is a compound of cerium, gadolinium or lanthanum.
7. A catalyst as claimed in claim 6, wherein the lanthanide compound is a compound of cerium
8. A catalyst as claimed in any one of the preceding claims wherein the palladium is present at a level in the range of about 50 ppm to about 1% by weight calculated as Pd metal and the weight of the total catalyst.
9. A catalyst as claimed in any of the preceding claims wherein the lanthanide compound is present at a concentration of 50 – 5000 ppmw based on the lanthanide metal and the weight of the total catalyst.

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10. A catalyst as claimed in any of the preceding claims wherein the atomic ratio of Pd to lanthanide metal is in the range 1 : 0.5 - 1 : 3.5.
11. A catalyst as claimed in any of the preceding claims wherein the palladium is present in the form of palladium metal.
12. A process for the hydrogenation of a hydrogenatable organic compound comprising the step of passing a mixture of a gaseous feed containing said hydrogenatable organic

compound and hydrogen over a catalyst which consists essentially of a palladium compound supported upon a support material characterised in that said catalyst further comprises a compound of a lanthanide.

13. A hydrogenation process as claimed in claim 12, wherein said hydrogenatable organic compound comprises an acetylenic compound.
14. A process as claimed in claim 13, wherein said gaseous feed stream contains a minor proportion of an acetylenic compound and a major proportion of an olefinic compound, in addition to hydrogen.
15. A process as claimed in claim 13 or claim 14, wherein said gaseous feed stream contains a minor proportion of acetylene and a major proportion of ethylene, in addition to hydrogen.
16. A process as claimed in any one of claims 12 to 15, wherein said catalyst is a catalyst as claimed in any one of claims 1 – 11.